

# *Nyaung-gan: A Preliminary Note on a Bronze Age Cemetery near Mandalay, Myanmar (Burma)*



ELIZABETH MOORE AND PAUK PAUK

THERE IS NO DATED BRONZE AGE material from Myanmar and the distribution of Bronze Age sites remains virtually unexplored. Even nonprovenienced bronze tools are rare in comparison to the abundance of lithic material (Morris 1938). Given the country's wealth of nonferrous ore deposits, a long sequence of prehistoric metallurgy is a reasonable expectation.

In January and February 1998, the Department of Archaeology, Ministry of Culture, carried out preliminary excavations south of Nyaung-gan Village, 120 km northwest of Mandalay. Four pits yielded a series of inhumation burials. Ceramic vessels comprised the predominant grave goods, and some large pots were possibly secondary burial urns. Bronze tools but not ornaments were found on some of the skeletons. Freshwater shells were also present. Stone artifacts included rings, beads, and tools. No iron was recovered, although six lead rolls were among the surface finds.

The site, in the country's arid zone, is located on the edge of a crater, one of a line of volcanoes spanning the Chindwin River. The area, traditionally known as *Tampadipa* or "land of copper" has abundant copper deposits. The Nyaung-gan cemetery is presented here as a Bronze Age site, and the finds are discussed in relation to material from both earlier and later periods. The bronze, stone, and ceramic goods from Nyaung-gan provide provenienced and typologically specific assemblages to begin to inform us about the mortuary culture of Bronze Age Myanmar.

## THE SITE AND ITS SETTING

The Nyaung-gan cemetery site lies 107 m above sea level at 95°04'E, 22°24'N (Fig. 1). It covers some 75 by 180 m, and is 2.4 km southwest of Ywatha Village in the Nyaung-gan Village tract (Ni Ni Myint 1998). Nyaung-gan Village takes its name from the Nyaung, one of the many species of *Ficus* or banyan tree and is

Elizabeth Moore is affiliated with the Department of Art and Archaeology, School of Oriental and African Studies, University of London, and Pauk Pauk is with the Department of Archaeology, Ministry of Culture, Mandalay Branch, Union of Myanmar.



Fig. 1. The Nyaung-gan crater and surrounding villages of Nyaung-gan, Ywatha, and Ok-aing. Ya Thae Kon is seen south of Ok-aing and further to the southwest, the edge of the Twindaung crater. Courtesy Office of Strategic Studies.

situated in Budalin Township, Sagaing division, Lower Chindwin district. The area is bounded to the west and south by the Chindwin River and the Pondaung-Ponnyadaung ranges; to the east by the Mu and Irrawaddy rivers (*Burma Gazetteer* 1912:1). The Chindwin is navigable for some 400 km north from the site, while the Irrawaddy is navigable year round to Bhamo (Penzer 1922:3-4).

Rainfall in the region is low, averaging 675 mm per annum, virtually all of it falling between May and October. Between November and March there is seldom more than 1.3 cm of rain. This regime mirrors that of Pagan, Myingyan division (*Burma Gazetteer* 1924:13, 1925:12). The soil is light alluvial, with groundnuts and other oil crops such as sesame (*Burma Gazetteer* 1912:78). Many fields of sunflowers are seen today, and in the area around Nyaung-gan, numerous bananas. The zone is also planted with millet, particularly suited to the light soil and arid conditions (Dobby 1950:170).

The cemetery south of the village is on the edge of a shallow explosion-crater without a lake and is in the same line as the crater of Twin, east of the Chindwin (*Burma Gazetteer* 1912:215). The Nyaung-gan crater is the most northerly of a line of volcanoes aligned southwest to northeast described as late Cenozoic (Hutchison 1989:225; Stephenson and Marshall 1984). The formation has long

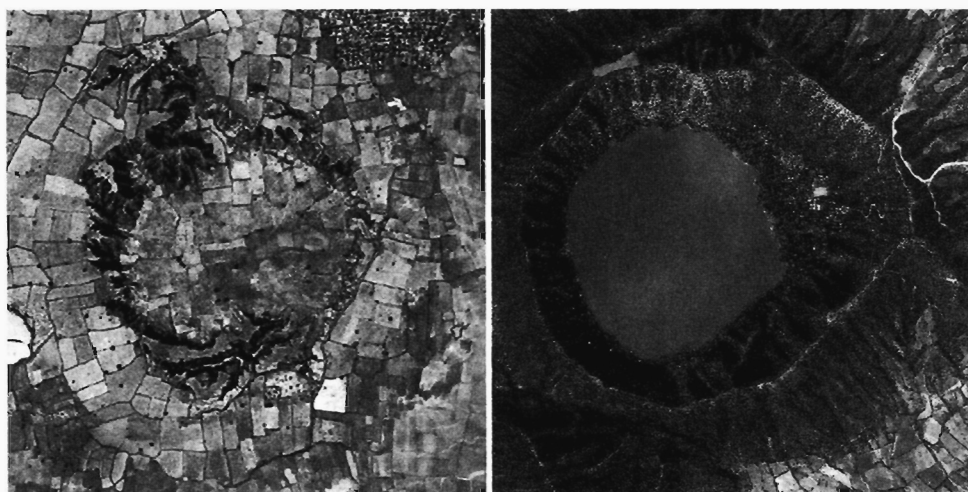


Fig. 2. Comparison of Nyaung-gan crater (left) and Twindaung (right). Courtesy Office of Strategic Studies.

been noted, with early twentieth-century reports describing eleven craters, a ridge of volcanic rock crossing the Shwezaye defile of the Chindwin River, and two located near Ok-aing, south of Nyaung-gan (*Burma Gazetteer* 1912:8).

The nearest crater to the site, Twindaung, has a diameter of just over a kilometer, similar to Nyaung-gan (Fig. 2). However, the Twindaung peak is higher and the crater deeper than Nyaung-gan. Twindaung reaches a height of 229 m, falling to 68 m at lake level, with the lake another 30 m deep. In comparison, Nyaung-gan drops only some 50 m from crest to crater floor. The green water of the Twindaung crater is caused by sulphate of soda. The *twin-po* insect found in the lake is dried and used as a condiment in pickled tea. The micro-algae *Spirulina* is marketed as a food supplement. The other three craters, Taungbyauk, Twindaung to the west, and Leshe, are on the opposite bank of the Chindwin, south of Yama Chaung Creek. They appear to have broken out along the Chindwin Valley, perhaps accounting for the narrowing of the river channel at this point (Chhibber 1927: 173). All are sited within areas of volcanic ash and tuff. The main rock types are olivine basalt, hornblende-augite andesite, with some quartz diorite, and, especially at Twindaung, pyroxenite.

On the opposite bank of the Chindwin, west of Monywa and south of the Yama Chaung, are three significant porphyry copper deposits: Sabedaung, Kyesindaung, and Letpadaung. These are in Pliocene-Quaternary intrusive formations, acid rocks in contrast to the basic craters to the north (Chhibber 1934, fig. 5; Hutchison 1996: 156). Late nineteenth-century accounts mention the remains of an old copper mine at Letpadaung (Jones 1887: 176). Along the bank of the Chindwin, near Kyaukmyet, there are a number of domed chambers, spaced about 30 ft apart. They are not vented, making use of the sloping riverbank for an updraft. Villagers say these kilns were used for lime, although lime kilns are normally two-chambered with a vent. Slightly inland around Kyesindaung there are



Fig. 3. The cemetery site shown in relation to Nan Oo Hpaya pagoda, the enclosed area of Thein Yin Yazagyo, and the Paw Daw Mu Hpaya pagoda. Courtesy Office of Strategic Studies.

shafts about 1 m in diameter, with highly vitrified interiors. Villagers are currently resmelting the refractory lining of these kilns to obtain copper.

Ancient smelting may have been carried out using copper-bearing rock ore with or without pretreatment. Traditional methods for both types of production may be seen today. In the Tampawaddy quarter of Mandalay, crushed ore is placed above layers of charcoal. Bellows force air into the chamber and a pool of copper forms on the bottom of the crucible.<sup>1</sup> Alternatively, the porphyritic copper-bearing stones may have first been crushed, panned, and then placed in a solution. Crystals form on the surface, which are then baked. This increases the copper content from the natural level of 7 percent to some 25 percent, and is easily smelted. The value of the porphyritic copper sulphate deposits of Kye-sindaung has long been recognized, with the word *dhota* or sulphate being part of a traditional honoring accorded to the king (e.g., Maung Tin 1914).

#### THE CEMETERY AND SURROUNDING AREA

The cemetery is located on a flattened spur, linked to Nan Oo Hpaya (pagoda) to form a U-shaped ridge on the northwest rim of Nyaung-gan crater (Fig. 3). On the cemetery plateau, drainage has created a steep gully, now the northwest boundary of the site.<sup>2</sup> The Nan Oo Hpaya ridge is to the east. On its highest point is a *zayat* (pavilion) dedicated to Shin Ma Chauk (Lady of the Precipice). She is said to favor red roses and has an April festival. Her story is linked to her husband Na Ga Dha Tha, a king who first came to Twindaung, and then retreated to Thein Yin Yazagyo ("hiding place"). Remains of a brick wall (107 by 122 m) enclose Thein Yin Yazagyo, on the northwest end of the Nan Oo ridge. Although the Department of Archaeology dug test pits at Thein Yin Yazagyo, only Konbaung period (eighteenth–nineteenth century A.D.) pottery was recovered. Thein Yin Yazagyo's pagoda, Paw Daw Mu Hpaya, to the northeast, has a *zayat*, but it is a rest house not a spirit shrine like Shin Ma Chauk's. The straight northern rim with the Paw Daw Mu ridge differs from the curving west part of the crater

where Nan Oo and the cemetery are found. The two parts may reflect different phases of volcanic activity, and a similar pattern is seen southeast of Twindaung.

There are a number of wells on the crater floor and abundant stone materials, both resources that would have enhanced its attraction for ancient occupation. The ground water in the southern part of the crater interior is higher than in the northwest where the cemetery is located. A garden well in the south portion of the crater bottom reached water at 1.2 m, although the well was dug to 5.9 m. The owners haul water manually, and said the well had water year round. A second well, in the northwest part of the crater floor, was dug through 10.4 m of sand and 1.8 m of clay to a depth of 12.2 m, but bedrock was not reached. This well can be pumped for a few hours only before running dry—however, the water always refills.

West of the cemetery to Ok-aing Village, the land is flat. Fields south of Ok-aing are known as Ya Thae Kon, the “mound of the forest-dwelling ascetic.” The area is dry, located north of the streams off Twindaung and south of those draining west to the Chindwin. It is the low point between the Nyaung-gan and Twindaung craters. Villagers speak of it as an ancient village where stone tools and rings were produced. There are a number of basaltic boulders over a meter high. Apart from these, the ground is flat, with few elevated portions to explain the name *kon* or mound.

Cultivation leading to erosion of the cemetery site by a villager, Chit Hlaing, has flattened the ridge and exacerbated the slope while gradually exposing the cemetery. Now sixty-four years old, Chit Hlaing came to Nyaung-gan at fourteen, having been born in Mandalay, where his father was an ironmonger. He married a local woman, and as she did not have fields, he was forced to find vacant land. The cemetery area had not, in local recollection, been cultivated before. Chit Hlaing cleared it of trees and leveled it. In the rainy season, and in some years, he began to find prehistoric tools. The first two were a halberd, similar to one recovered during excavation, and a large paddle-shaped bronze axe. When he uncovered the first skeleton, he grew afraid, and felt the skeleton was laughing at him. He quietly kept the tools in his home, not even cleaning them. Other villagers knew of his finds, but none found similar pieces. Around 1996, a carpenter in the village who had been apprenticed to a traditional architect, Win Maung of Tanpawaddy, mentioned Chit Hlaing's collection. Win Maung visited Chit Hlaing many times, finding him at first fearful to talk about the site, but then relieved to recount his troubling finds. Thus, prior to the preliminary excavations of the Department of Archaeology, objects had been recovered and an unknown amount of overburden removed. As a result, many burials, particularly those on the lower slope of the cemetery plateau, were virtually at surface level.

### *The Excavation Pits*

Four pits totaling nearly 400 sq m were excavated: SE pit, 8.2 by 24.3 m with 23 burial features; M pit, 7.3 by 12.1 m, with 5 features; NW pit, 5.5 by 10.7 m, with 15 features; and NE pit, 4.6 by 7.0 m, with 2 features. Finds include pottery, human and animal bones, stone and bronze tools. The majority of bronzes also come from the SE pit, which had a concentration of bronzes in the middle sec-

tion of the pit. There were also 88 small shell beads recovered, and 1 freshwater bivalve shell.

Many questions await further study. These include the contents of different types of pots, the stratigraphic and chronological relationship of overlapping burials and pots, and the presence of additional bronze and stone artifacts on burials only partially exposed.

### *Stone Rings and Pounders*

The types of stone rings found around Nyaung-gan and Ok-aing area have traditionally been associated with a nonmetal-using Neolithic period. They are not regarded as Pyu artifacts, although they have been recovered at Halin. However, there are stone rings from Taungthaman, near Amarapura, where iron is also reported. Rings have been found at many sites in the Central Zone divisions of Mandalay, Sagaing, and Magwe. Further research and excavation are needed to see if there are sites with inhumation burials, stone rings, and tools but no metal.

While the Nyaung-gan rings all are stone, their shape varies to include circular, triangular, and ovoid examples. The hole is always a perfect circle, although not always centered. Several were drilled with holes for repair. Most stone rings from sites in Thailand are also circular, repairs indicating that they, too, were highly valued. However, they are more often circular and flanged. At Ban Chiang, northeast Thailand, both bronze and stone bangles are reported for the Middle period (c. 1000–300 B.C.), some with holes (e.g., Labbé 1985:39; White 1982:39). At the nearby first millennium B.C. site of Ban Na Di, nine complete or partial stone bracelets were found, principally in the earlier phases of the site where bronze was rare. Initially dated 900–100 B.C., this phase is now dated 600–400 B.C. Bronze bracelets were found in later phases of the site but in conjunction with shell rather than stone bracelets. One of the early phase marble examples had holes and traces of bronze wire used for repair (Higham 1996:204; Higham and Kijngam 1984:435, 460).

Some of the stone rings from Nyaung-gan burials were on the wrist, others on the leg, by the shoulder, or pelvic area. One burial in the NW pit had three rings, one on the upper right shoulder, one on the pelvic area, and one underneath the left arm, a varied placement implying a range of ritual meanings including, perhaps, fertility. This is supported by a bronze relief figure (66 cm high) of a “mother goddess” from Mahlaing Township, Mandalay division, that has a ring inscribed around the pelvis (Win Maung 1998:85).

Measurements of the diameters of the holes in 30 rings from Halin and Nyaung-gan ranged from 3.0–7.0 cm with an average of 5.04 cm. The average length was 11.84 cm, width 9.8 cm, and thickness 0.90 cm. Five rings in the National Museum from Taungthaman were also measured (Fig. 4). Two were very different from any of the Nyaung-gan finds: one had a flange around the inner hole, another was star-shaped with nine points. The internal holes were similar in diameter at 5.3 cm, and the rings themselves are more nearly circular, from 14.3–15.6 cm. They were also slightly thicker at 1.28 cm.<sup>3</sup> Very similar rings made from stone, turtle shell, and bronze are known from western Thailand.

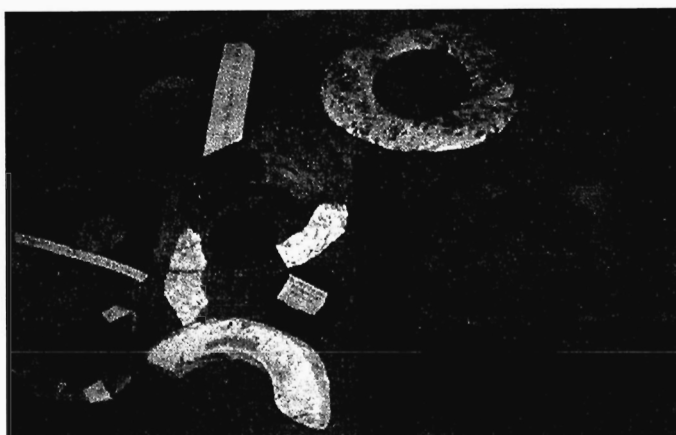


Fig. 4. Stone rings from Nyaung-gan. Black ovoid ring in upper part of picture (from SE pit) is 15 cm long, 13 cm wide, 1.1 cm thick, with a hole diameter of 5.5 cm. Triangular ring on bottom left (from NW pit) is 9.7 cm long, 7.5 cm wide, 1.0 cm thick, with a hole diameter of 3.6 cm. Disc is 3.6 cm in diameter and 0.4 cm thick. Courtesy Office of Strategic Studies.

Most of the stone in the Nyaung-gan crater and around Ok-aing is derived from acidic parent lava. Materials provisionally identified include crystalline igneous andesitic rocks, dolerite (diabase), basalt, rhyolite (greenish apatite), serpentine-bearing rock, and silicified tuffs.<sup>4</sup> Quartzes are also found on the crater floor, and around Ok-aing, but were not used for the manufacture of stone rings.

Stone rings, axes, and basalt pounders appear to have been made around Ya Thae Kon. Ya Thae Kon's location between Twindaung and the Nyaung-gan craters makes it an obvious source of basalt and other igneous rocks for rings and stone pounders. One broken polished stone axe (4 cm long, 3.5 cm wide, with a 2 cm-long beveled end) was recovered from the Nyaung-gan crater floor during the August 1998 survey. Additional stone objects from the site included two beads, one surface find and one from Feature SE8, measuring 17.5 and 14 cm with a diameter of 0.7 cm. Both had four holes: one at each end, and one on each long side.

A basalt pounder from the Nyaung-gan site now in the National Museum, Yangon, is similar to those found during a survey south of Ok-aing. All the Ok-aing pieces were recently broken. They were of similar dimensions, ovoid in section with a diameter ranging from 3.5 to 4.5 cm. Their original height appears to be 10–15 cm. They are beveled on one end, with a flattened round top showing wear from pounding. The function of the pounders remains to be clarified. The edge can be sharp, so they could have been used for cutting wood or bamboo. This is related to suggestions that methods used for cutting of the inner disc of the stone rings were similar to those seen today among some of the hill peoples. This method uses a section of bamboo with a sharp bevel on one end, kept steady by wood brackets. It is turned with a rope or strap twisted around the midsection, with sand and water used as grinding materials. As the bamboo becomes dull, it is replaced by another section.

### *Pottery*

A rough count was made of pottery vessels in the burial features. Some of the very small vessels resemble ingot molds excavated in central Thailand (Bennett 1988:131). A small number of the larger vessels, some 60 cm in diameter, lay in rows of two or three, above burials, and most were filled with smaller pots. The relationships of the large urns to the burials was not always clear because, in places, there were several underlying skeletons. It remains uncertain whether they are secondary burial urns or offerings for the inhumations.

Another vessel type that occurs only in the NW and SE pits has a pedestal with three upright supports on the dish. Some supports are rounded, others flat with holes. There are also holes along the outside of the pot where the supports were attached. These vessels may have been stoves with a fire in the bowl below the smaller pot supported by the uprights.<sup>5</sup> Another possibility is that they were for alcohol production, similar to ones used for small-scale distillation today. In this, four pots are used: (1) a large vessel over the fire containing water, fermented with tree bark and sugar; (2) a middle pot with holes in the base; (3) a small pot supported inside the middle one; and (4) an uppermost vessel filled with cold water. In this process, steam from the fermented mixture rises through the holes in the middle pot, condenses on the base of the top vessel containing cold water and then drips into the small pot below.<sup>6</sup>

### *Bronze Tools*

The 18 bronze tools from Nyaung-gan, now in the National Museum, range in weight from 8.4 to 234.9 g. They include spears, points, axes, and a halberd. The longest blade measures 24.5 cm, although the heaviest is a paddle-shaped tool (Fig. 5).

Copper ingots and bronze casting molds are absent, highlighting the need for further survey. The stratigraphic and material culture relationship of pots and skeletons also needs more analysis. Half of the tools now in the National Museum come from burial contexts. Five tools were associated with pot burials and four found on inhumation burials. The other nine were either from outside the pits or previously recovered by Chit Hlaing. The halberd from burial M5 is very similar to the first tool Chit Hlaing recalls finding. A third halberd, of similar size, has been recovered from Halin. However, the shaft of the Halin halberd bears a finely made raised pattern of cross-hatching bordered by lateral lines.<sup>7</sup>

Three small bronze samples, perhaps casting spillage rather than artifacts, from the Ya Thae Kon area were submitted to the University Research Centre for X-ray fluorescence analysis. Copper, in roughly the same proportion in all three samples, was the main element, with tin and lead as minor components. Tin was very low in one sample, slightly higher in the others, one of which also had traces of iron, lead, and arsenic.<sup>8</sup> Five further fragments collected from the same area during the August 1998 survey also appeared to be casting spillage. November 1998 analysis of a bronze axe from Salingyi, on the opposite bank of the Chindwin (courtesy of the Nara Cultural Properties Research Institute), showed an extremely high (99.5 percent) copper content.



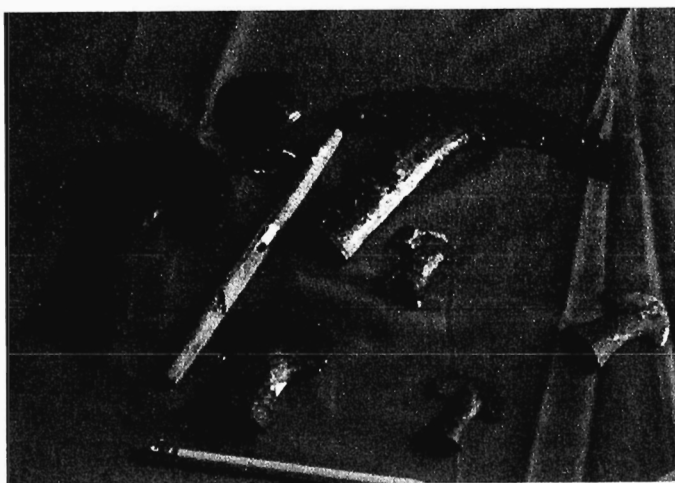


Fig. 5. Some of the bronze tools from the Nyaung-gan site. From left, upper row: National Museum no. 193/14-2 paddle-shaped tool recovered by Chit Hlaing; National Museum no. 193/17-5 burial feature SE6; National Museum no. 193/18-1 halberd from burial feature M5; 193/14-18 small axe recovered by Chit Hlaing; National Museum no. 193/14-16 from burial feature SE12. Front row, from left 193/17-5 from burial feature SE8, recovered in small pot; National Museum no. 193/14-17 from burial NW4. Courtesy Office of Strategic Studies.

#### OTHER PREHISTORIC MATERIALS FROM MYANMAR

##### *Stone Age*

Having introduced the Nyaung-gan area and the preliminary excavation finds, the following sections discuss finds from the excavation in relation to the earlier Stone Age and later Pyu periods.

To date, there are few provenienced and dated stone tools from prehistoric sites in Myanmar. The limestone cave of Padah-lin (96°18'E, 21°06'N; Map 2) on the Shan Plateau, has been the most thoroughly explored (Aung Thaw 1969a, 1971; Aung Thwin 1982:5). Uncalibrated radiocarbon dates from charcoal and bone samples indicate a broad age range of c. 13,400 ± 200–1750 ± 80 B.P. but there is little reported evidence for the contexts and associations of the material. The pebble choppers, adzes, and scrapers are by convention labeled Mesolithic or Hoabinhian. Also recorded from Padah-lin were flakes, edge-ground tools, and an unfinished shouldered adze (Aung Thaw 1969a:12–13). Recently other caves have been identified in this area with similar assemblages.

##### *The Pyu Period*

This is dated between the first and ninth centuries A.D., and is associated with the absorption of Buddhist and Hindu concepts into traditional cults. Pyu sites are typically walled enclosures with a central palace structure and a mixture of inhumation and cremation burials. Artifacts include stone beads, bronze bracelets

and sculptures, silver "coins," and iron tools. Issues yet to be resolved include the degree to which the use of bronze and iron tools and weapons overlap; the extent to which stone tools continued in use; whether the stone rings were exclusive to the Bronze Age; and possible continuities in burial customs. There are many so-called Pyu sites yet to be fully investigated, and in this period epigraphy continues to guide archaeology, with the labels Pyu and Mon implying that inscriptions related to linguistic groups may be used to define cultures—a problematic procedure.

In comparing Pyu and Bronze Age sites the obvious differences are the scale of the sites and the appearance of Indic-related material at the former. Nyaung-gan has not yet yielded any Buddhist or Hindu sculpture, nor evidence of brick structures. So far, no walls have been discovered around Nyaung-gan, and the enclosed area north of the cemetery, Thein Yin Yazagyo, has yielded only eighteenth–nineteenth-century sherds.

Pyu sites have yielded a range of iron tools and weapons. Bronze artifacts are principally ornaments, sculpture, and urns. Bronze finger rings and bangles and copper latch eyes were excavated at Beikthano (Aung Thaw 1968:55, fig. 84). At Srikshetra, bronze sculptures included a small figure of Avalokitesvara; five beautifully executed figures of dancers, and a 28-cm-high elaborate bronze bell (Aung Thaw 1972:29, 31). Bronze mirrors were among the finds at Halin, and it was noted that villagers had melted down many metal goods (Aung Thaw 1972:12).

Silver objects are also common at Pyu sites, notably silver coins found at Beikthano, Srikshetra, Halin, and other sites, and the silver gilt urn from the Khin Ba mound is an exceptional piece (Aung Thaw 1972:28; Guy 1997:92, fig. 5). Surface survey at the Pyu site of Maingmaw (96°12'E, 21°17'N) yielded lead rolls with traces of writing inscribed on them, and eight similar lead rolls, measuring 1.3–1.5 cm, are among the surface finds at Nyaung-gan. Lead artifacts excavated at Beikthano included flat circular pieces of lead, a lead ball, and a small weight in the shape of a truncated cone (Aung Thaw 1968:54). Stone molds for casting, presumably gold ornaments, were found at both Maingmaw and Beikthano (Aung Thaw 1968:148; Aung Thwin 1982–1983:18). These finds show that by the early first millennium A.D. a range of metals were being employed to make numerous objects for ritual, agricultural, military, and ornamental use. What remains to be explored is the absence, both at Pyu sites and Nyaung-gan, of molds for bronze casting, and of elaborate bronze ornamental or ritual objects, such as drums and urns like those from sites in China, Thailand, Cambodia, or Viet Nam.

Since Halin is the closest Pyu site to Nyaung-gan, comparisons between the sites is of interest. The earlier phases of Halin have been assigned to the first to sixth centuries A.D. In 1996, a low mound (HL19) was excavated in the west part of Halin. Three complete skeletons were unearthed with urns found near their heads (San Win 1996, unpublished report). The combination of inhumations and secondary burial urns follows the pattern of earlier excavations (Aung Thwin 1982–1983; Myint Aung 1970), and also recalls the Nyaung-gan finds. Finally, as discussed earlier, pre-Pyu bronzes and stone rings found at Halin are similar to those from Nyaung-gan.

## SUMMARY

Nyaung-gan adds a new dimension to the prehistory of Myanmar. Despite many differences between Pyu sites and their repertory of finds, the presence of Nyaung-gan type bronzes at Halin suggests the possibility of an earlier occupation of some Pyu sites. The cemetery location is also significant, both its siting on the crater and adjacent to the rich copper deposits on the opposite bank of the Chindwin. The area's low rainfall and access to navigable waterways links it to other sites in the central zone, Pyu, and Pagan. The discoveries at Nyaung-gan extend into prehistory a long-term pattern of occupation, technological developments, and the beginnings of urbanism within the most arid region of the country. Further research may also bear out evidence of continuity in mortuary practices between Pyu and earlier periods, such as the use of inhumation and urn burials. The possibility of Bronze Age burials at Pyu sites also deserves further investigation.

## ACKNOWLEDGMENTS

The support of Col. Than Tun, Maj. Bo Bo, Maj. Khin Maung Win, and the staff of the Office of Strategic Studies have been invaluable in coordinating the research leading to this preliminary report. We also thank the Ministry of Culture, the Ministry of Education, and the Myanmar Ivanhoe Copper Company Limited (MICCL). Teachers and headmen at Halin and Nyaung-gan villages have also been generous with their time. We would like to thank Chit Hlaing for his patience in answering many questions. All errors in interpretation are, however, our responsibility.

## NOTES

1. Win Maung (Tampawaddy), pers. comm. August 1998.
2. Aung Myin, assisted by Khin Maung Si and Myo Myint Win, Monywa Waterway Department, Ministry of Transport, carried out a preliminary survey of the site on 2 August 1998. From a datum of 0.0 located 7 m southwest of SE pit, the site falls to  $-0.84$  m below datum in the ravine, rising to  $+7.04$  m above datum on the edge of the cemetery plateau, 62 m northeast of the datum.
3. Courtesy Kyaw Win, National Museum, Yangon, with assistance from Daw Htay Htay Swe.
4. Department of Geology, Yangon University (Pe Maung Than), Mandalay University (Prof. Kan Saw), and Kyaw Win, MICCL. Any errors in identification are the authors' responsibility.
5. Capt. Kyaw Zin Thet, Monywa Command, pers. comm. August 1998.
6. Win Maung (Tampawaddy), pers. comm. August 1998.
7. Ibid.
8. San Nyein, University of Yangon found the samples during survey in May 1998.

## REFERENCES CITED

## AUNG THAW

- 1968 *Report on the Excavations at Beikthano*. Rangoon: Union Government of Burma, Ministry of Union Culture.
- 1969a The "Neolithic" culture of the Padah-lin caves. *Journal of the Burma Research Society* 52(1):9-23.
- 1969b The "Neolithic" culture of the Padah-lin caves. *Asian Perspectives* 14:123-138.
- 1972 *Historical Sites in Burma*. Rangoon: Ministry of Culture, Union Government of Burma.

## AUNG-THWIN, M.

- 1982- Burma before Pagan: The status of archaeology today. *Asian Perspectives* 25(2):1-21.
- 1983

## BENNETT, A.

- 1988 Prehistoric copper smelting in central Thailand, in *Prehistoric Studies: The Stone and Metal Ages in Thailand*: 125–134, ed. P. Charoenwongsa and B. Bronson. Bangkok: Thai Antiquity Working Group, Papers in Thai Antiquity 1.

## BURMA GAZETTEER

- 1912 *Lower Chindwin District*. Rangoon: Office of the Superintendent of Government Printing, Burma.  
1925 *Lower Chindwin District*, vol. B, no. 34. Rangoon: Office of the Superintendent of Government Printing, Burma.

## CHIBBER, H. L.

- 1927 The ancient volcanoes of Burma. *Journal of the Burma Research Society* 17: 169–173.  
1934 *The Mineral Resources of Burma*. London: Macmillan.

## DOBBY, E.

- 1950 *Southeast Asia*. London: University of London Press.

## HIGHAM, C.F.W.

- 1996 *The Bronze Age of Southeast Asia*. Cambridge: Cambridge University Press.

## HIGHAM, C.F.W., AND A. KIJNGAM

- 1984 *Prehistoric Investigations in Northeast Thailand*. Oxford: British Archaeological Reports, International Series 231 (1–3).

## HUTCHISON, C. S.

- 1989 *Geological Evolution of South-East Asia*. Oxford: Oxford Science Publications, Clarendon Press.  
1996 *South-East Asian Oil, Gas, Coal and Mineral Deposits*. Oxford: Oxford Science Publications, Clarendon Press.

## JONES, E. J.

- 1887 Notes on Upper Burma. *Records of the Geological Survey of India* 20: 170–194.

## LABBÉ, A. J.

- 1985 *Ban Chiang: Art and Prehistory of Northeast Thailand*. Santa Ana, CA: Bowers Art Museum.

## MORRIS, T. O.

- 1938 Copper and bronze antiquities from Burma. *Journal of the Burma Research Society* 28(2): 95–99.

## MYINT AUNG

- 1970 The excavation at Halin. *Journal of the Burma Research Society* 53(2): 55–63.

## NI NI MYINT, DAW

- 1998 Report on recent archaeological findings in Budalin Township: Sagaing division. Paper presented at the conference on Myanmar culture and society: Traditional spirit and path to modernity. 22–24 July 1998, Chulalongkorn University, Bangkok.

## PE MAUNG TIN

- 1914 Rajadhiraja Vilasini or the manifestation of the king of kings. *Journal of the Burma Research Society* 4: 5–21.

## PENZER, N. M.

- 1922 *The Mineral Resources of Burma*. London: George Routledge and Sons.

## SAN WIN

- 1996 Field Report, Archaeology Diploma, Department of Archaeology, Yangon University, Yangon.

## STEPHENSON, D., AND T. R. MARSHALL

- 1984 The petrology and mineralogy of Mt. Popa volcano and the nature of the Late-Cainozoic Burma volcanic arc. *Journal of the Geological Society London* 141: 747–762.

## WHITE, J.

- 1982 *Discovery of a Lost Bronze Age: Ban Chiang*. Smithsonian Institution and University Museum, University of Pennsylvania.

## WIN MAUNG (TANPAWADDY)

- 1998 Myanmar-pyi-hma ami-nat thami-yoke. *Mya Yeik Nyo Magazine*, 6 (February), pp. 83–90. Yangon.

## ABSTRACT

Preliminary excavations were made in 1998 at a cemetery south of Nyaung-gan Village, near Mandalay, in central Myanmar (Burma). The site is located on the edge of a volcanic crater; there are nearby copper deposits. Three main types of artifacts were recovered from the excavation: ceramics, stone rings, and bronzes. Survey of the surrounding area includes possible smelting and stone ring production sites. Much remains to be learned about the Nyaung-gan cemetery, but it is already clear that the finds from the site contribute greatly to the knowledge of Myanmar prehistory. KEYWORDS: Burma, Myanmar, prehistory, Pyu, stone rings, Southeast Asia.